

Bellwork: 1/9/13

Solve using the quadratic formula:

$$\begin{aligned}
 3x^2 &= 2(2x+1) \\
 3x^2 &= 4x + 2 \\
 3x^2 - 4x - 2 &= 0 \\
 a=3 \quad b=-4 \quad c=-2
 \end{aligned}$$

$$\frac{4 \pm \sqrt{(-4)^2 - 4(3)(-2)}}{2(3)}$$

$$\frac{4 \pm \sqrt{40}}{6}$$

$$\frac{4 \pm 2\sqrt{10}}{6} = \frac{2 \pm \sqrt{10}}{3} \text{ or }$$

$$\frac{4 + \sqrt{40}}{6} = 1.7 \quad \frac{4 - \sqrt{40}}{6} = -0.4$$

40
4 10
22 52

Page 1

Algebra 2B - Imaginary & Complex Numbers

Simplify.

$$\begin{aligned}
 1.) \sqrt{16 - 4(2)(1)} & \quad 2.) \sqrt{64 - 4(1)(16)} & 3.) \sqrt{25 - 4(1)(8)} \\
 \sqrt{8} & \quad \sqrt{0} & \sqrt{-7} = i\sqrt{7} \\
 \text{2 real answers} & \quad \text{1 real answer} & \text{0 real answers}
 \end{aligned}$$

Imaginary Numbers

If $r > 0$, then the imaginary number $\sqrt{-r}$ is defined as follows:

$$\begin{aligned}
 \sqrt{4} &= \sqrt{4} \cdot \sqrt{1} \\
 \sqrt{-4} &= \sqrt{4} \cdot \sqrt{-1} \\
 \sqrt{-r} &= \sqrt{-1} \cdot \sqrt{r} = i\sqrt{r} \\
 \sqrt{-4} &= i\sqrt{4} = 2i
 \end{aligned}$$

Example 1: $\sqrt{-4} = 2i$

Example 2:

a.) $\sqrt{-4} = 2i$

b.) $\sqrt{-6} = i\sqrt{6}$

c.) $\sqrt{-28} = 2i\sqrt{7}$

a.) Complete the table below.

i	$i^2 = -1$	$i^3 = -i$	$i^4 = 1$
$i^5 = i$	$i^6 = -1$	$i^7 = -i$	$i^8 = 1$
$i^9 = i$	$i^{10} = -1$	$i^{11} = -i$	$i^{12} = 1$

i chart:

$$\begin{aligned}
 i^1 &= i \\
 i^2 &= -1 \\
 i^3 &= -i \\
 i^4 &= 1
 \end{aligned}$$

Complex Numbers

$$a + bi$$

(standard form)

where a is called the real part

and b is called the imaginary part

Page 2

$$\begin{array}{ccc}
 \sqrt{-16} & \sqrt{-5} & \sqrt{-25} \\
 4i & i\sqrt{5} & 5i \\
 \\
 \sqrt{-12} & \sqrt{-48} & \sqrt{-50} \\
 i\sqrt{12} & & \\
 \uparrow 4\sqrt{3} & & \\
 \textcircled{2 \cdot 2} & 4i\sqrt{3} & 5i\sqrt{2} \\
 \textcircled{2i\sqrt{3}} & &
 \end{array}$$

Page 3

Algebra 2B - Imaginary & Complex Numbers

Example 1: Find each sum and difference.

$$\begin{array}{ll}
 \text{a.) } (-3+5i)+(7-6i) & \text{b.) } (-3-8i)-(-2-9i) \\
 -3+5i+7-6i & -3-8i+2+9i \\
 -3+7 & -3+2 \\
 5i-6i & -8i+9i \\
 \boxed{4-i} & \boxed{-1+i}
 \end{array}$$

YOU TRY: Find each sum and difference.

$$\begin{array}{ll}
 1.) (-9+2i)-(3-4i) & 2.) (-10-6i)+(8-i) \\
 -9+2i-3+4i & -10-6i+8-i \\
 -9+3 & -10+8 \\
 2i+4i & -6i-i \\
 \boxed{-12+6i} & \boxed{-2-7i}
 \end{array}$$

Example 2: Multiply $(2+i)(-5-3i)$

$$\begin{array}{cccc}
 F & O & I & L \\
 2 \cdot -5 & 2 \cdot -3i & i \cdot -5 & i \cdot -3i \\
 -10 & -6i & -5i & -3i^2 \\
 i^2 = -1 & & & -3(-1) \\
 -10 & -6i & -5i & +3 \\
 \text{YOU TRY: Multiply } (6-4i)(5-4i) & & & = \boxed{-7-11i}
 \end{array}$$

$$\begin{array}{cccc}
 F & O & I & L \\
 6 \cdot 5 & 6 \cdot -4i & 5 \cdot -4i & -4i \cdot -4i \\
 30 & -24i & -20i & +16i^2 \\
 i^2 = -1 & & & 16(-1) \\
 30 & -24i & -20i & -16 \\
 \boxed{14-44i}
 \end{array}$$

Page 4

Algebra 2B - Imaginary & Complex Numbers

☺ In order to simplify a fraction containing complex numbers, you need to use the *conjugate of a complex number*.

Conjugate of a Complex Number

****The conjugate of a complex number $a + bi$ is $a - bi$**

Example 3: Simplify $\frac{2+5i}{2-3i}$. Write your answers in standard form.

YOU TRY: Simplify $\frac{3-4i}{2+i}$. Write your answers in standard form.

YOU TRY: Simplify $\frac{3-2i}{-4+i}$. Write your answers in standard form.

Homework: pg 253 #8-12 all and 18-⁸⁶~~20~~ even

8, 9, 10, 11, 12, 18, 20, 22, 24, 26

